

Goal-directed Ultrasound for the Diagnosis of Long-bone Fractures by Crew Medical Officer Analogs.
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Introduction

Current construction activities on-board the International Space Station (ISS) may increase fracture incidence in space, and ultrasound (US) is the only on-board diagnostic imaging capability. The clinical utility of US in identifying long-bone fractures is unknown, particularly using non-radiologist operators. We sought to determine the accuracy of US in identifying fractures of the humerus and femur, as performed by emergency medicine physicians and surgeons with minimal experience in ultrasound image acquisition and interpretation, after a standardized training session.

Methods:

The study was conducted between December, 2000, and August 2001, on patients enrolled after informed consent from a convenience sample of all trauma patients admitted to the Emergency Department, in whom x-rays of the upper arm, thigh, or hip was planned to rule out a fracture. The US images were obtained before definitive radiologic studies, and were categorized as positive, negative, or indeterminate for fracture. The investigators were physicians without formal training in US, who had previously viewed a 45 minute CD-ROM on bone ultrasonography followed by a one-hour training session on a live model. Results were compared to initial clinical impression and final diagnosis determined by clinical evaluation and subsequent radiologic evaluation.

Results:

In 35 patients, the humerus (11) and the femur (24) were imaged. Three US evaluations resulted in indeterminate results. In the remaining 33, US was 100% sensitive in identifying a fracture (95% CI 0.89-1.0) and 84% specific (95% CI 0.67-1.0), with an overall accuracy of 91% (95% CI 0.81-1.0). All patients with high clinical suspicion for fracture, and one with moderate suspicion, were identified correctly by US as having a fracture. None of the patients with an indeterminate US had a fracture.

Conclusions:

These preliminary data indicate that US is very sensitive and moderately specific for detecting acute traumatic fractures in long-bones.